REPORT OF ACCIDENT OCCURING AT THE CUSTOMS AND EXCISE PROJECT ON THE GOVERNMENT CAMPUS, RICHMOND STREET, PORT OF SPAIN ON 12TH JULY 2006

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1.0 EXECUTIVE SUMMARY

At approximately 11:00am on Wednesday July 12th 2006 seventeen persons were injured when a scaffold approximately 100ft in height collapsed at the Customs and Excise Project on the Government Campus, Richmond Street, Port of Spain. At the time of the accident some workers were installing a solar panel (Glass pane) on the eight level and some were installing metal cladding between the 2nd and 8th levels.

The injured persons were taken to the Port of Spain General Hospital. Some of the victims received critical injuries and were warded, and some were administered medical treatment and discharged. Two victims were referred to the St. Clair Medical Center.

The initiating event that led to the collapse of the scaffold was not determined during the accident investigation. However the factors that contributed to the collapse of the scaffold were as follows:

- The provision of inadequate information by NHIC and SASSL during the design and construction phases of the collapsed scaffold.
- Scaffold not being erected in accordance with the design specifications.
- Instability and lack of support consequent to;
  - Inadequate number of ties to provide the required support for the scaffold.
  - Inadequate arrangements to ensure the maintenance of the ties that provided support for the scaffold
  - Inadequate diagonal bracing on the scaffold
  - Inadequate number of base plates used for the scaffold

The underlying cause of this accident was the implementation and monitoring of a Management System for Safety and Health that was inadequate.

Section 49(1) of the Factories Ordinance Chapter 30 No. 2 applies to Building Operations and Works of Engineering Construction. This section exempts such sites from section 21 of the Factories Ordinance where it provides for "safe means of access to every place at which any person has at any time to work."

No other breaches of the Factories Ordinance could be identified.

Possible breaches were identified in the following sections of the Occupational Safety and Health Act (OSHA), 2004 Act No. 3 of 2006 (OSHA).

- Section 6 (1)
- Section 6 (2) (e)
- Section 6 (7)
- Section 7 (1)
- Section 8 (2)
- Section 8 (4)
- Section 13 (A)
- Section 13 (1) (a)
- Section 13 (3)

Based on the findings of the investigation it was recommended that the relevant parties take the appropriate measures to eliminate the relevant breaches and inform the Factory Inspectorate in writing of the measures implemented.

Where possible the alleged breaches could be pursued.

2.0 INTRODUCTION

The objectives of the investigation into the accident were the determination of:

- the underlying cause;
- the immediate cause and contributing factors; and
- legal compliance by the relevant stakeholders.

Visits were made to the "Customs Building" construction site (JM photo 1) on the 12th, 14th, 17th 21st July and the 03rd and 30th August 2006 to conduct investigations into the accident.

On July 12th discussions were held with;

- Omar Jugmohan - Project Manager NH International Caribbean (NHIC)
- John Connon - Managing Director NHIC
- Dianne Piper Salandy - Director of Administration NHIC

On July 14th there was a meeting at the NH International Caribbean Ltd (NHIC) site office.

Persons from the following establishments attended;

- Urban Development Company of Trinidad & Tobago (UDECOTT)
- Turner Alpha Limited (TAL)
- NH International Caribbean Ltd (NHIC)
- Factory Inspectorate, Ministry of Labour and Small and Micro Enterprise Development (MLSMED)
- Ministry of Works and Transport (MW&T)
- Port of Spain City Corporation
- Safeway Access & Support Systems Limited (SASSL)
- Caribbean Industrial Research Institute (CARIRI)

NHIC was advised that the Factory Inspectorate would be conducting an investigation into the accident with Technical assistance from the Ministry of Works and Transport and CARIRI.

On this date an inspection to the accident site was undertaken by the following ;

- Winston Chin Fong - UDECOTT Representative
- Patrick Smith - TAL Representative
- Paul O'Connor - U.S based Scaffolding Expert invited by

UDECOTT / TAL

- Jeffrey Millington - Factory Inspectorate, MLSMED
- Bruce Farley - Chief Designs Engineer, MW&T
- Montano Graham - Civil Engineer II (Ag), MW&T
- Richard Fulchan - Civil Engineer, Designs, MW&T
- Marco Nunes - Materials Engineer, Caribbean Industrial Research Institute (CARIRI)

Samples of parts of the scaffolding were taken away from the site by CARIRI for "metallurgical testing." The procedure followed for the removal of the samples are outlined on page 2 of CARIRI's correspondence dated July 28, 2006, attached as Appendix JM 01.

3.0 METHODOLOGY

The methodology adopted for the investigation of this accident included the following:

- Inspection of the accident site and the collapsed scaffold
- Forensic testing of sampled parts of the collapsed scaffolding by CARIRI
- Discussions with members of senior Management from the following:
  - UDECOTT – Project Client
  - TAL - Project Manager
  - NHIC - Principal Contractor
  - SASSL - Sub-Contractor
  - Movalite - Sub-Contractor
  - ABEL - Sub-Contractor
  - We-Haul - (An Abel Sub-contractor)
- Review of Management System for Safety and Health
- Review of the following documents
  - Design sketch of scaffold
  - Addendum 1 to the Tender Documents, Annexed and Included In The Contract Agreement Between UDECOTT and NHIC
  - Letters from Turner Alpha Limited regarding Safety and Health Issues
  - Hazard Operation Reports from Turner Alpha Limited
  - Inspection Checklist completed for Scaffold at the Customs and Excise Construction Site
  - Training Records SASSL's Foreman and Field Supervisor
  - SASSL's Health Safety and Environmental Management Plan
  - NHIC Health and Safety Plan
  - Section of the Contract Bill of Quantity re- Safety
  - CARIRI Forensic Report of samples of parts of collapsed scaffold
  - Ministry of Works and Transport Report on the collapsed scaffold
- Interviews with some of the accident victims

4.0 PERSONS INTERVIEWED

Several persons were interviewed. However, not all were prepared to give statements. Following is a list of the persons interviewed. Where statements were given they are attached as appendices as indicated;

- Gerard Nina - Chief Civil Engineer, UDECOTT
- Winston Chin Fong - Construction Manager, UDECOTT
- Richard Smith - Project Superintendent, TAL
- Shaffick Majeed - Health, Safety and Environmental Manager, TAL
- Wintemore Clarke - Health and Safety Officer, TAL
- Omar Jugmohan - Project Manager, NHIC
- Michael Philips - Construction Manager, NHIC
- Shurland Paul - Health and Safety Officer, NHIC
- Hashim Ali - Managing Director, SASSL
- Reaz Ramlochan - Field Supervisor, SASSL
- Elton Thomas - Foreman SASSL (Appendix JM 02)
- Maurice Mc Kel - Senior Projects Coordinator, Movalite
- Andrew Best - Accident victim, Movalite (Appendix JM 03)
- Ian Elliot - Accident victim, Movalite (Appendix JM 04)
- Keno Marquis - Accident victim, Movalite (Appendix JM 05)
- Floyd Simmons - Accident victim, Movalite
- Mr. Mooteram - Manager, ABEL South Quay, POS
- Alan Viera - Manager We-Haul
- Eddison Alexander - Accident victim ABEL / We-Haul
- Ryan Stoll - Accident victim ABEL / We-Haul
- Mark Lutchman - Accident Victim ABEL / We-Haul
- Allan Sorzano - Accident Witness ABEL / We-Haul
- Curtis Langaigne - Accident Witness ABEL / We-Haul Job Supervisor

5.0 FACTS

5.1 Overview

An access Scaffolding was erected by SASSL in April 2006 at the east side of Structure 2 This was done in accordance with a scaffold layout design (Appendix JM 06) developed by SASSL and NHIC.

On July 12th 2006 at approximately 11:00 am employees from the subcontractors, Movalite, ABEL / We-Haul, NHIC and SASSL were undertaking work from various levels of the scaffold ranging from Level 2 to Level 9 when the scaffold collapsed.

Immediately after the collapse, a number of persons were rescued by workers from the construction site and taken to the Port of Spain General Hospital.

The Emergency Health Services (EHS) and the Fire Services were summoned and were on site by 11:15am. They removed the remaining victims to the Port of Spain General Hospital

Among the persons taken to the Port Of Spain General Hospital, two of them were then sent to the St. Clair Medical Center for CT Scans.

The police "K9" unit searched through the collapsed scaffold to ensure that all the victims were rescued.

5.2 The Victims

Following is a list of the victims.

Name	Company
Mark Lutchman	ABEL
Jeremy Fox	ABEL
Sean Mattas	SASSL
Glenn Innis	ABEL
Kareem Thomas	NHIC
Floyd Simmons	Movalite
Hayden Peters	Movalite
Julien Dunbar	Movalite
Andrew Best	Movalite
Kerwin Thomas	ABEL
Leon Henry	Movalite
Ryan Stall	ABEL
Ian Elliot	Movalite
Damain Simmons	SASSL
Eddie Alexander	ABEL
Sean Hercules	NHIC
Keno Marquez	Movalite

As at August 06th 2006 all victims except Floyd Simmons were discharged from the hospital.

5.3 The Scaffold

5.3.1 Scaffold Design:

The scaffolding involved in the accident was a Kwikstage Scaffolding. Mr. John Connon from NHIC indicated that the scaffolding was purchased by NHIC in August 2005 and was a mixture of new and "second hand" scaffold in a ratio of about 75% : 25% .

During discussions with Omar Jugmohan, NHIC Project Manager it was disclosed that the design and erection of the access scaffolding for the Customs and Excise Project were

undertaken by SASSL and NHIC. The scaffold layout was designed with the aid of computer software owned by SASSL.

NHIC had a sketch design (Appendix JM 06) for the scaffolding to be erected and a brochure for the Kwikstage scaffold (Appendix JM 06 – A) and provided copies . No other documentation was provided regarding the erection of the scaffolding. The Scaffold was to be erected in accordance with this design sketch.

5.3.2 Scaffolding Structure

During discussions Mr. Hashim Ali, SASSL's Managing Director revealed that;

- When the scaffold was erected there were double box ties on Levels 1, 3, 4, 5, 6 and 8. (Box ties are ties consisting of four sides fitted directly against the four faces of a rectangular column)

- The scaffold spanned a distance "through" five columns. The double box ties were placed on three of the columns and column ties were used on the column at each "end."

- The columns were approximately 24 to 28 feet apart.

- There were also miscellaneous tie inserts on various levels.

- Prior to SASSL "handing over" the scaffold to NHIC, SASSL personnel inspected it to ensure its safety and structural integrity. There was no documentation provided to verify this or to provide detail on that inspection.

SASSL's Foreman stated that for the Customs and Excise Project SASSL were required to erect the "scaffold tower" and install planks on the top three levels only. The remaining planks were to be installed by NHIC. He also stated that there were ties on the 2^{nd}, 4^{th}, 5^{th}, 6^{th}, and 8^{th} level. (Appendix JM 02, paragraph 3 of Elton Thomas' statement).

During discussions NHIC Project Manager denied this and revealed that NHIC was responsible only for the erection of internal scaffolding to be erected on the various levels in the interior of the structure.

During the investigation no documentation could be uncovered to reveal the details of the arrangement that was made between NHIC and SASSL.

The Kwikstage scaffold brochure revealed that the platforms were designed to support the maximum load class of 3.00 KN/m^2. There was no evidence to suggest that the number of persons and the load on any of the platforms of the scaffold may have exceeded this value.

There was also no evidence that indicated that there may have been any contact with the scaffold by construction plant or vehicles or that the wind was a major contributing factor in this accident.

The foundation for the scaffold was a concrete platform. (JM Photo 2). In normal circumstances this platform could have supported the load of the scaffold and its contents.

5.3.3 Inspection Arrangements

Records of scaffold inspections revealed that SASSL personnel were conducting them on a weekly basis. The results were recorded on a SASSL scaffold inspection checklist. (Appendices JM 07, JM 08 and JM 09)

The inspection conducted for the completion of the checklist was a visual one.

The checklist used contained no information regarding the elements on the scaffold that were inspected. The checklists provided seem to suggest that the last inspection recorded for the scaffolding that collapsed was on the 06th July 2006. On this report it was indicated that the "scaffold seems to be in good condition."

There were also scaffold reports for Structure 1 West (Appendix JM 09). They also indicated that the "scaffold seems to be in good condition." These scaffolds required further work after July 12th 2006 to make them safe. Subsequent to an inspection of the scaffold on July 14th, the Industrial Inspections Supervisor authorized NHIC to undertake work required to ensure the structural integrity of these scaffold.

During discussions SASSL's foreman and Field Supervisor indicated that the Inspection Checklist used was meant to be an internal "record-keeping document." They revealed that there was no contract for SASSL to conduct scaffold inspections for NHIC.

5.3.4 Arrangement for Scaffold Modifications

There were no documented procedures to be followed regarding arrangements for the modification of scaffolding. NHIC's on site Safety Officer revealed that persons wishing to have any modifications or adjustments to the scaffold were required to inform the NHIC supervisor. He would have then made the necessary arrangements with SASSL personnel to facilitate the requested modification or adjustment. This was the required arrangement for "External Scaffolding" for which SASSL was contracted. (Appendix JM 10 paragraph 10).

There were no records to reveal modifications made, as there were no systems implemented for the recording of this information.

During discussions, NHIC Construction Manager, Michael Philips revealed that for scaffolds used in the interior of the structure, NHIC riggers would make the necessary

modifications. A rigger is one who works with hoisting tackle, cranes, pulleys and scaffold.

6.0 TRAINING OF SASSL SUPERVISORS

During the investigation enquiries were made as to the training and experience of SASSL's supervisors to determine their level of technical competence.

6.1 SASSL Field Supervisor

Mr.Reaz Ramlochan had fourteen years experience in the scaffold industry.
He has the following certification from Safety and Access Ltd -

Basic Scaffolder Training	24 – 28 January 2000
Advanced Scaffolder Training	19 – 23 March 2001
BasicScaffold Inspection Training	02 – 05 April 2001

He also participated in RGIT MONTROSE Two-day basic HSE refresher Training Course conducted on April 08 – 09 2003 (Appendix JM 11).

6.2 SASSL Foreman

Mr. Elton Thomas had a total of 15 years experience in the scaffold industry.
He has the following certification from Safety and Access Ltd:

Advanced Scaffolder Training	16 – 20 March 2005 (Appendix JM 12)

7.0 VISUAL AND POST ACCIDENT CONDITIONS

1) The scaffolding involved in the accident spanned the horizontal distance between five columns on the eastern side of Structure 2.
2) Some parts on the scaffold were actually pieces of corrugated steel welded to the scaffold tubes (JM Photos 3,4 & 5)
3) Base plates were not used on all standards (vertical tube) of the scaffold.
4) There was evidence on the first level to indicate that the scaffold was tied at this level. Included in the various ties were double box ties on each of three columns. The columns on the "ends" were excluded.
5) On the second level, there was a "vertical scaffold tube" on the inside face of the wall with a horizontal tie to the scaffold.
6) There were ties to the columns on the third floor.
7) On the fourth level, double box ties were observed on two columns. In both installations the outer face of the columns were plastered and painted black. The horizontal supports for the box ties were not against the face of the columns. They were not in a position to prevent inward movement of the scaffold. They were inadequate

8) On the sixth level two double box ties were observed on each of two columns. On one of the column the box tie was incomplete (JM Photo 6) while on the other, the box tie allowed for movement (JM Photo 7). These ties were inadequate. The concrete outer face of the columns on this floor was not plastered or painted. Parts of the concrete were "chipped off deliberately in preparation for plastering. There were impact marks against a third column that may have resulted from a box tie.
9) There were no box ties on the seventh floor. There were "impact marks" to suggest that other ties may have been used.
10) There were no ties to the scaffold from the eighth or ninth levels on which solar panels were already installed.
11) On the tenth level (ROOF TOP), there were four impressions to suggest that there was tying-off of the scaffold from the rooftop. (JM Photos 8 & 9)
12) On the scaffold on the West side of Structure 2, the supports on the roof were bolted into the concrete work (JM Photo 10). The supports on the rooftop for the scaffold that collapsed were not bolted into the concrete work.
13) There were other scaffolding of the same design and constructed by SASSL on other parts of the building

8.0 ARRANGEMENTS FOR SAFETY AND HEALTH ON THE CUSTOMS AND EXCISE

8.1 The Client: Urban Development Company of Trinidad and Tobago (UDECOTT).

In the Pre-Tender phase of the Customs and Excise Project, UDECOTT required that the successful tenderer submit *a written statement of the safety practices and procedures,* which would be adopted for the duration of the construction period.
Additionally the following were also requirements:

(i) The provision of a Safety Officer for the duration of the works to monitor that all safety procedures were being adhered to.
(ii) All personnel on site to have protective clothing, shoes and hard hats, dust masks, harnesses as necessary;
(iii) Regular seminars / training sessions be held with workmen to inform them of safety procedures and practices being adopted;
(iv) Provision of a fully stocked First Aid kit to be on site at all times; and
(v) Provision of proper signs to be placed throughout the site.

This was stated in the Contract Bills of Quantities (Appendix JM 13 – An Extract from Contract Bills of Quantities pg 1/37).

NHIC, the tenderer to whom the contract was awarded made the necessary arrangements for the abovementioned points (i) to (v) and submitted a Health and Safety Plan in lieu of a written statement of the safety practice and procedures as requested (Appendix JM 14).

UDECOTT also contracted the services of Turner Construction-International as the Project Manager.

8.2 Turner Construction-International, Project Manager.

As regards safety management the Project Management Contract between UDECOTT and Turner Construction- International included the following:

- **Item 6 Safety Management**: The Project Manager shall implement the safety plan developed during the pre-construction phase, leading the coordination and institutionalization of safety into daily activities and include a review of compliance in its monthly report.

- **Item 11 Safety Program:** The Project Manager will establish requirements for job site safety along with a safety training program and which would be in accordance with the Laws of Trinidad and Tobago and which will be required in all contractor's agreements. The Project manager will oversee the implementation of this plan, including its incorporation into the packaged bidding process. The project Manager will prepare a preliminary safety manual and report followed by a periodic monitoring and reporting procedure to be followed throughout the duration of the project.

This was stated in Addendum 1 to the Tender documents, annexed and included in the contract agreement between UDECOTT and NHIC – Project Management Contract between UDECOTT and Turner Construction -International (Appendix JM 15 points 6 and 11).

There was a letter dated 16th June 2005 from Turner Alpha Limited that informed NHIC that there was improper installation of ladders and scaffolding (Appendix JM 16).

There was a letter dated 01st July 2005 from Turner Alpha Limited that informed NHIC that there was evidence of improper scaffolding erection (Appendix JM 17).

In a letter dated March 09th 2006 Turner Alpha Limited advised all Contractors on the Government Campus Plaza that TAL engaged the services of a qualified full time safety representative on the Government Campus Plaza Site (Appendix JM 18).

The responsibilities of this representative were listed as follows:

1) To enforce compliance by all parties with the principles of the new Trinidad and Tobago OSHA regulations and the Contractor's HSE manuals, requiring timely mitigation of potential hazards for all job site operation
2) Assist all contractors in preplanning their operations to prevent injury or property damage.
3) Chair Project Safety Meetings once a month.

4) Prepare, issue and periodically update the Code of safety practiced as construction proceeds.
5) Issue safety Bulletins for the project.
6) Review and enforce the recommendations of the Safety Managers, following job tours and of the Toolbox Meeting Minutes.
7) Conduct periodic safety tours to ensure compliance and issue reports.
8) Investigate accidents and direct the abatement of hazardous conditions.

Turner Alpha Limited maintained the following safety records;

- Turner Alpha weekly Hazard Operation Reports and Safety Notices detailing Safety Infractions by NHIC.
- Minutes of the Progress Meeting with NHIC.

There was a Hazard Observation report dated March 02nd 2006 from TAL which identified "Scaffold not erected properly" as a hazard (Appendix JM 19). The proposed corrective action was listed as "Scaffolds to be erected in accordance to OSHA standards, and inspected and recorded daily."

8.3 The Principal Contractor NH International Caribbean Limited (NHIC)

The Principal Contractor contracted by UDECOTT, developed, implemented and monitored the arrangements as outlined in its Health and Safety Plan. These included the arrangements as outlined in the Pre-Tender phase by UDECOTT

The Health and Safety Plan revealed that the objective of NHIC was to provide a safe and healthy place of employment for all employees.

Upon receiving the Safety Plan there were no arrangements in the Safety Plan to address the following;

- Risk identification, risk assessment and risk management
- Evaluation of the safety performance of the sub-contractors
- Communication and coordination of the work to be done by the sub-contractors
- The management of any change that may be introduced into the project.

The safety plan did not address arrangements to be implemented in meeting its broad objective of a "safe and healthy workplace for all employees," or the *safety practices and procedures,* to be adopted for the duration of the construction period.

8.4 SASSL

SASSL was the sub contractor involved in the erection of the scaffolding that collapsed. SASSL was contracted by NHIC and had a policy for Health Safety and Welfare that was prepared by S.H.E. Laboratory Services in which it was stated that "all practicable

measures are taken to avoid risk to employees, contractors, the general Public and environment."

Among other things the policy provided for the following;

- Risk Analysis and Control
- Risk and Hazard Assessment

(Appendix JM 20 is an extract from this Policy and outlines a policy for scaffolds and platforms)

No evidence was provided to show that SASSL's operations were in accordance with their Health, Safety and Welfare Policy.

8.5 Movalite

Movalite was contracted by NHIC to replace a damaged solar solar panel (glass pane) on level seven of the building. Movalite had no Safety and Health Policy. The work that was undertaken by Movalite was to be done in accordance with the NHIC Safety and Health Policy.

8.6 ABEL

ABEL was contracted by NHIC to undertake metal cladding works on the building. ABEL sub-contracted some of its work to a Company known as We-Haul. ABEL had an Environmental Health and Safety Manual. While undertaking work for ABEL, We Haul were to do so in accordance with that Manual.

The manual provided among other things information on the following:

- Job Safety Analysis and Control
- Risk Assessment
- Safe Operating Procedures

No information was provided to suggest that the employees of We-Haul were familiar with the abovementioned Safety Manual or that they were conducting their undertaking in accordance with this manual.

9.0 DISCUSSION:

9.1 The Scaffold

9.1.1 Based on information provided by SASSL's Foreman and Field Supervisor as well as NHIC Project Manager during discussions, it could be concluded that the scaffold was not erected in accordance with the design sketch. Only a section of the scaffold from the

design sketch was erected. Additional ties were included to provide additional support for the structure erected.

From the design sketch the southern part of the scaffold (that was not) erected had diagonal braces in opposite directions to prevent movement in either direction. In the section that was erected there were braces in one direction only. **The diagonal bracing in the scaffold that collapsed was installed in one direction only in accordance with the sketch. This was inadequate for the prevention of motion and would have contributed to the instability of the scaffold.**

9.1.2 The software used by SASSL in designing the arrangement of the scaffold would have provided for the use of components that met with the manufacturer's specifications. It did not give consideration to the mixing of new and second hand components in the scaffold in which some parts in the "second hand scaffold" were modified with pieces of corrugated steel (JM Photos 3, 4,& 5). **Therefore the scaffold erected and the one on the design sketch would have differed in their specifications.**

There may have been inadequate planning during the design of the scaffolding by NHIC and SASSL as no information was provided during the investigation to suggest that adequate consideration was given to the use of mixed components as well as modified and corroded components. The computer software would not have given consideration to these provisions.

SASSL's Field Foreman stated that he was instructed by NHIC personnel to "follow how others erected similar scaffolds" when erecting the scaffold. No other instructions or information was provided to the SASSL's Field Supervisor and Foreman for the erection of the scaffold except for the design sketch. This may have also been a contributing factor in the scaffold not being erected in accordance with the design.

9.1.3 The inspection checklist used by SASSL for the inspection of the scaffold was inadequate. No information was provided regarding the elements on the scaffold that was being examined. The inspection report completed for July 06th 2006 by SASSL's Field Supervisor referred to in paragraph **5.3.3**, stated that the scaffold "seems to be in good condition." This report was inadequate as it contained ambiguity as to whether it was in good condition and therefore could have influenced the use of the scaffold

There were similar reports for similar scaffold that were conducted on the same date. These scaffolds had to be properly secured on Saturday July 15th 2006 (Appendices JM 08 and JM 09). This implied that either the inspection of the scaffold undertaken was inadequate or that subsequent to the inspections there were interventions that caused the scaffold to require "additional securing" on July 15th.

9.1.4 Regarding the arrangement for scaffold modifications, no records were provided during the investigation that revealed changes effected to the scaffold subsequent to its erection as there were no systems in place for this. Consequently, the interventions that

led to the observed changes in the scaffold ties as compared to what they should have been when it was erected could not be identified.

This was indicative of inadequate planning and supervision by the Principal Contractor.

9.2 Post Accident Conditions

9.2.1 Base plates were not used on all standards (vertical tubes) of the scaffold. These served to aid in ensuring that the scaffold was level and their absence would have made such leveling difficult. Therefore the absence of the base plates would have impacted on the overall stability of the scaffold.

9.2.2 Some of the box ties on the Level 4 and Level 6 were adjusted to facilitate the undertaking of work on the columns. These adjustments as observed would have affected the integrity of the scaffold as the box ties would not have prevented inward movement (toward building) of the scaffold. Such adjustment made the ties ineffective and would have also impacted on the overall stability of the scaffold.

9.2.3 There were no ties to the scaffold on the Levels 7, 8 and 9. Solar panels were already installed on Levels 8 and 9.

There was therefore an approximate distance of forty-five feet between the box ties on Level 6 and the rooftop. This was not in accordance with the design sketch used and resulted in an insufficient number of box ties for support of the scaffold.

Though the scaffold design sketch was used as the "standard" for erecting the various scaffolds on the project the ties used from the rooftop were inconsistent. The scaffold support on the West side of Structure 2 was bolted into the concrete work whereas those on the East side of the structure were not. The support provided on the East side of the structure was of a lower standard.

The work that was undertaken on Saturday 15th July 2006 to provide additional support for existing scaffolds was indicative of the abovementioned inadequacy and ineffectiveness of the ties that were on the similarly designed Kwikstage Scaffold.

The above listed factors would have contributed to the immediate causes of the accident.

9.3 Arrangements for Safety and Health on the Customs and Excise Project

9.3.1 UDECOTT did not provide Project Specific Details to identify Safety and Health requirements for the Customs and Excise Project from the tenderer.

The Principal Contractor met the requirements as outlined in the pre-tender phase. However, the Health and Safety Plan that was submitted was inadequate as a sole document to govern the management of health and safety risks on the project. It was used

in lieu of the *written statement of the safety practices and procedures* required in the pre-tender. It did not address the safety practices and procedures of scaffold use and maintenance. As a consequence the Health and Safety Plan contributed to an inadequate management system for Health and Safety on the project.

9.3.2 Regarding Safety Management as outlined in item 6 of the Project Management Contract, the plan implemented was the abovementioned NHIC Health and Safety Plan and therefore this would have impacted on the quality of the Health and Safety Management afforded by the Project Manager. The Preliminary Safety Manual referred to in item 11 was not prepared.

By letter dated March 09th 2006 from Turner Alpha Limited, contractors on the Government Campus Plaza were advised that TAL had engaged the services of a qualified full time Safety Representative. It outlined an excellent initiative as the Occupational Safety and Health Act 2004 (OSHA, 2004) was proclaimed in February 2006.

However, there was no evidence that the items listed under (1) to (6) in this letter were actually done. These items would have contributed to an increased performance in the Management of Safety and Health on this project

The letters sent to NHIC by Turner Alpha Limited (paragraph 8.2) regarding the erection of scaffold was indicative that Turner Alpha Limited was aware that failure of scaffold could have catastrophic consequences. However, the Project Manager did not evaluate the systems in place for scaffold safety or its risk assessment to determine the adequacy.

Hazard Observation report dated March 02nd 2006 from TAL identified "Scaffold not erected properly" as a hazard. The proposed corrective action was listed as "Scaffolds to be erected in accordance to OSHA standards, and inspected and recorded daily." However, there was no evidence to show that the corrective measures were taken.

At the time of the accident there was no system in place for daily inspection as recommended. Considering the items mentioned in paragraph 9.3.2, Turner Alpha Limited, may not have done all that was reasonably practical to prevent the occurrence of events that resulted in the collapse of the scaffold.

9.3.3 Based on information revealed during the investigation the employees of the various contractors were not conducting their undertaking in accordance with the Health and Safety Policy that the subcontractors were to be using. This may have impacted on the emphasis placed on ensuring the safety of the workplace and the effectiveness of any management system implemented for Safety and Health.

SASSL and NHIC were involved in the design of the arrangement of the scaffold. However during the erection of the scaffold the design sketch was used as the standard for erection although SASSL's Health and Safety Policy recommended that all scaffolding be erected according to the OSHA (Occupational Safety and Health

Administration) 29 CFR (Code of Federal Regulations) 1926.451 and 1920.28 standards. (A standard developed and implemented in the United States of America).

10.0 CARIRI'S FORENSIC TEST RESULTS

The report from Cariri (Appendix JM 21), revealed that the degree of corrosion on the parts of the scaffold was a contributing factor in the occurrence of this accident. However, it should be noted that such corrosion was a secondary contributing factor.

The hardness test showed a significant difference in hardness between the weld, heat affected zone (HAZ), and base metal. That indicated that a high level of stress was introduced at that location through the welding operation. This would have also occurred on similar members of the scaffolding that contained similar welds and therefore would have also caused the specifications of these modified scaffold members to differ from that of the manufacturer's specification.

11.0 Ministry of Works and Transport Report on the Scaffold

The findings of the technical experts from the Ministry of Works and Transport confer with the findings of the Factory Inspectorate. (Appendix JM22).

12.0 CONCLUSION

12.1 The scaffold was not erected in accordance with the design sketch that was developed, or in accordance with any other scaffold standard.

12.2 Base plates were not used on all the scaffold tubes that made contact with the ground and their absence could have impacted on the stability of the scaffold.

12.3 Only one section of the scaffold from the design sketch of a complete scaffold was erected. The diagonal bracing on that section was inadequate to provide support against movement of the scaffolding. Therefore this would have impacted on the stability of the scaffold.

12.4 There were inadequate arrangements to ensure that the box ties on the scaffold were maintained. As a result there was an intervention that led to the number of box ties above the sixth level becoming inadequate to afford the appropriate support to the scaffold.

Additionally some ties were adjusted to facilitate the undertaking of work. This action decreased the effectiveness of the ties and could not have provided the required support to the scaffold.

12.5 In view of points 12.1 to 12.4 it is concluded that the immediate causes of the accident would have been the instability and lack of support provided for the scaffold.

As work was undertaken from the scaffold the resulting movement of the scaffold may have been beyond the limits of the joint connection resulting in its collapse.

12.6 UDECOTT contracted the services of TAL to include the Management of Safety and Health. TAL was required to perform specific contractual duties as outlined in paragraph 8.2. During the investigation no information was provided to reveal that UDECOTT implemented arrangements to ensure that TAL was performing the services contracted regarding safety and health. Similarly there were no arrangements implemented to show that there were adequate communication and coordination among UDECOTT and TAL to ensure the implementation and effectiveness of a Safety programme as referred to in paragraph 8.2.

The underlying cause was the implementation and monitoring of a Management System for Safety and Health that did not provide the essential elements required for the effective identification of and management of site-specific risks. The system made no provisions for regular inspections to evaluate its effectiveness.

To varying degrees, the following establishments may have been responsible for this;

- NH International Caribbean Ltd
- Turner Alpha Limited
- UDECOTT
- SASSL
- Movalite
- ABEL / We-Haul

13.0 LEGAL IMPLICATIONS

Section 49(1) of the Factories Ordinance Chapter 30 No. 2 applies to Building Operations and Works of Engineering Construction. This section exempts such sites from section 21 of the Factories Ordinance where it provides for "safe means of access to every place at which any person has at any time to work."

No other breaches of the Factories Ordinance could be identified.

There were possible breaches in the Occupational Safety and Health Act (OSHA) 2004 and its amendments. These breaches would have contributed to the occurrence of this accident. The breaches were examined taking into consideration the co-existing responsibilities of the parties on site (diagram showing the relationships of the Client, the Project Manager, the Principal Contractor and other contractors on site whose employees were injured - Appendix JM 23).

13.1 UDECOTT

UDECOTT is the Client and the Occupier for the PK-1 Customs Building Contract and therefore has ultimate control over the workplace. UDECOTT had no direct control over the employees on the site as they are the employees of the various contractors.

UDECOTT employed the services of a Principal Contractor, NHIC to manage the work on the construction site.

NHIC employed the sub-contractors and therefore had direct control over the work of these sub-contractors. In this capacity NHIC was also responsible for ensuring access and egress to the workplace.

As employers, the various sub-contractors were responsible for the safety and welfare of their employees undertaking work on the construction site

Section 8 (2) of the Occupational Safety and Health ACT 2004 (OSHA 2004) states that the occupier of an Industrial Establishment shall "prepare or revise, in consultation with worker representatives in the industrial establishment a written statement of his general policy with respect to the safety and health of persons employed in the industrial establishment, specifying the organization and arrangements for the time being in force for carrying out that policy." This Policy is meant as a framework to promote the efficient management of Safety and Health at the workplace.

As regards to such a policy, UDECOTT provided for the Principal Contractor to develop and implement that policy (section **8.1**). It was anticipated that the NHIC Health and Safety Plan would have met the requirements of section 8(2) of OSHA and that the Occupier would have been in compliance. However the Policy as developed and implemented by the Principal Contractor for the Occupier was not in accordance with OSHA, 2004.

UDECOTT may therefore be in breach of section 8(2) of OSHA.

Section 8(4) of OSHA, 2004 states that "An occupier shall ensure, so far as is reasonably practicable, that no unsafe structure exists in the industrial establishment that is likely to expose persons to risks to bodily injury."

UDECOTT employed the services of a Project Manager who was expected to develop and implement safety programmes and Management systems to control safety risks on the worksite (paragraph 8.2).

As discussed in paragraph 11.6 UDECOTT did not implement measures to ensure that the Project Manager was meeting its contractual safety and health responsibilities.

The Project Manager did not ensure that there were "requirements for job site safety" regarding the provision and maintenance of scaffold on the construction site.

Though UDECOTT may have delegated the responsibility under section 8(4) of OSHA to the Project Manager there remains the issue as to whether the Occupier had carried out this duty so far as is reasonably practicable.
Therefore UDECOTT may also be in breach of section 8(4) of OSHA.

13.2 Turner Alpha Limited

There were certain contractual obligations that Turner Alpha Limited did not fulfill and there were certain Safety and Health issues that should have been addressed further in an attempt to ensure the effectiveness of the Safety and Health Management System that was in place (Paragraph 8.2).

By not performing these duties as discussed in paragraph 9.3.2 TAL would not have ensured the provision of an adequate Safety Program and Safety Management for safety and health risks at the construction site.

In so doing Turner Alpha Limited may have breached section 7(1) of OSHA 2004 that states " it shall be the duty of every employer to conduct his undertaking in such a way as to ensure, so far as is reasonably practicable, that persons not in his employment, who may be affected thereby are not thereby exposed to risks to their safety or health."

13.3 NH International Caribbean Ltd

Section 6(1) of OSHA, 2004 states "it shall be the duty of every employer to ensure, so far as is reasonably practicable, the safety, health and welfare at work of all his employees."

An employee of NHIC was injured in the accident. It is therefore possible that there was a breach of this section by NHIC.

Sections 6(2) and its sub-sections identify matters to which the general duty in section 6(1) refers. Therefore NHIC may have also breached the following:

Section 6(2)(e) that requires the employer "so far as is reasonable practicable as regards any place of work under the employer's control, the maintenance of it in a condition that is safe and without risks to health and the provision and maintenance of means of access to and egress from it that are safe and without such risks." As the scaffolding was the means of access to the workplace and the workplace was under the control of the NHIC, this section may have been breached.

Section 6(7) that requires an employer of an industrial establishment of twenty-five or more employees to prepare or revise "in consultation with the representatives of his employees, a written statement of his general policy with respect to the safety and health

of persons employed in the industrial establishment specifying the organization and arrangements for the time being in force to carry out that policy and the requirements of sub-sections (1) to (6A) ……"

NHIC Safety Plan was used as the "written statement of general policy." There were deficiencies in the Safety Plan as outlined in paragraph 8.3.

This "Safety Plan" (Policy) was not in accordance with this section as it did not specify the organization and arrangements for the time being in force to carry out that policy and the requirements of sub-sections (1) to (6A). Therefore this section may have been breached.

Section 7(1) states " it shall be the duty of every employer to conduct his undertaking in such a way as to ensure, so far as is reasonably practicable, that persons not in his employment, who may be affected thereby are not thereby exposed to risks to their safety or health.

The provision and maintenance of the access scaffolding involved in this accident was the undertaking of NHIC. Persons using the scaffolding at the time of the accident were exposed to risks to their safety and health. Therefore this section may have been breached

The scaffold involved in the accident was purchased by NHIC (paragraph 5.3.1). The design of the scaffold used was done by NHIC and SASSL.

Section 13 (1) (a) requires that a person who designs, manufactures, imports, or supplies any technology, machinery, plant, equipment or material for use in any industrial establishment to ensure so far as is reasonably practicable, that the technology, machinery, plant equipment or material is safe and without risks to health when properly used.

NHIC may be in breach of this section both as the person who purchased (imported) the scaffold as well as a person involved in the design of the scaffold used.

13.4 SASSL

As an employer whose employee was a victim of the accident may have breached Section 6(1) of OSHA 2004 that states "it shall be the duty of every employer to ensure, so far as is reasonably practicable, the safety, health and welfare at work of all his employees."

SASSL employees did not erect the scaffold in accordance with the design sketch. (paragraph 9.1.1). This gives rise to the issue as to whether the employees of SASSL were provided with adequate information, instruction, training and supervision (paragraph 9.1.2 and 9.1.3) to undertake work.

Therefore SASSL may have also breached Section 6(2)(d) that require the employer to provide such information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the safety and health at work of his employees.

SASSL erected the scaffold. By not erecting the scaffold in accordance with the design sketch (paragraph 9.1.1) or in accordance with an internationally accepted standard, SASSL may have exposed persons not in his employment to safety risks and therefore may have breached section 7 (1) of OSHA 2004.

Section 7(1) states " it shall be the duty of every employer to conduct his undertaking in such a way as to ensure, so far as is reasonably practicable, that persons not in his employment, who may be affected thereby are not thereby exposed to risks to their safety or health." By not erecting the scaffold in accordance with the design sketch or in accordance with an accepted standard SASSL may have exposed persons not in its employment to safety risks.

The use (completion) of the "inspection checklist" that was meant to be an internal document for use by SASSL may have contributed to SASSL's possible breach of this section.

Section 13 (1) (a) requires that a person who designs, manufactures, imports, or supplies any technology, machinery, plant, equipment or material for use in any industrial establishment to ensure so far as is reasonably practicable, that the technology, machinery, plant equipment or material is safe and without risks to health when properly used.

SASSL may be in breach of this section as the person who was involved in the design of the scaffold used and whose software was used without giving consideration to the specifications or modifications made to the "used scaffold." (paragraphs 5.3.1 and paragraph 10.0).

Section 13 (3) states, "It shall be the duty of any person who erects or installs any machinery, plant, equipment or component thereof, in any premises when that article is to be used by persons at work to ensure, as far is reasonably practicable, that nothing about the way in which it is erected or installed makes it unsafe or exposes persons to risks to their safety or health when properly used." As the erector of the scaffolding that collapsed, SASSL may have breached this section.

13.5 Movalite

Movalite may have breached Section 6(1) of OSHA 2004 that states "it shall be the duty of every employer to ensure, so far as is reasonably practicable, the safety, health and welfare at work of all his employees."

Movalite employees were victims of this accident. This sub-contractor relied on the Principal Contractor to provide a safe place of work for its employees. This gives rise to

the issue as to whether Movalite had done all that was reasonably practicable to ensure the safety, health and welfare at work of all its employees.

13.6 ABEL / We-Haul

We-Haul may have breached Section 6(1) of OSHA 2004 that states "it shall be the duty of every employer to ensure, so far as is reasonably practicable, the safety, health and welfare at work of all his employees."

We-Haul employees were victims of this accident. This sub-contractor relied on ABEL and the Principal Contractor to provide a safe place of work for its employees. This gives rise to the issue as to whether We-Haul had done all that was reasonably practicable to ensure the safety, health and welfare at work of all its employees.

14.0 RECOMMENDATIONS

The Client, Project Manager, Principal Contractor and Sub-Contractors should implement measures to eliminate the above breaches of legislation. The Factory Inspectorate should be informed in writing of the measures that will be implemented to achieve this by the respective establishments.

The measures to be implemented should include but not be limited to the following:

14.1 UDECOTT

Develop and implement a Health and Safety Policy in accordance with OSHA. Among other things the arrangement section in the policy should include arrangements to:

- Ensure provision of a Pre-Tender Safety and Health Plan;
- Selection of Competent Contractors (Which includes Project Managers);
- Ensure that construction work commences only after the development of an appropriate construction phase site specific Safety and Health Plan that outlines measures for risk identification and Management; and
- Evaluation of Safety and Health performance of the Project Manager.

14.2 Turner Alpha Limited

Develop and implement a Health and Safety Policy in accordance with OSHA. Among other things the arrangements section in the policy should include arrangements to:

- Ensure that there is a site specific Safety and Health Plan;
- Ensure, so far as is reasonably practicable, that enough attention has been paid to health and safety during design, and that the design includes adequate information about anything which might affect the health or safety of people

carrying out construction work or anyone else who might be affected by this work;

- Evaluate the Safety and Health Performance of the Principal Contractor;
- Ensure that the measures implemented for communication and collaboration among the contractors regarding safety and health remains effective;
- For the Audit / Review of the Contractor's Management System for Safety and Health to identify elements that may require improvement as well as areas that could be improved;and
- Audit / Review of inspection systems implemented to ensure integrity of Plant and Equipment.

14.3 NHIC

Develop and implement a Health and Safety Policy in accordance with OSHA. Among other things the arrangements section in the policy should include:

- The selection of competent sub-contractors;
- That all sub-contractors conduct their undertaking in accordance with a site specific Safety and Health Plan approved by the Principal contractor;
- Effective communication and collaboration between sub-contractors;
- The development of a Safety and Health Committee in accordance with OSHA;
- Undertaking of Risk Assessment in accordance with OSHA;
- Management of change (eg. Changes in design, changes in procedure, modifications etc);
- Accident Reporting and Investigation;
- Evaluation of Safety and Health performance of its employees as well as the sub-contractors; and
- Training and Development.

14.4 SASSL

SASSL should review its Safety and Health Policy to evaluate the adequacy of arrangements for the requirements of section 6(1) to (6A) in OSHA .

Measures should also be implemented to ensure that employees conduct their undertaking in accordance with this Safety and Health Policy.

14.5ABEL / We Haul

Abel should develop and implement arrangements to ensure that its sub-contractors conduct their undertaking in accordance with a Safety and Health Policy that is approved by Abel as well as the Principal Contractor.

Regarding paragraph 13.0 of this report legal action should be initiated where possible for the breaches as outlined.

Jeffrey Millington 31/1/06

Jeffrey Millington
Safety and Health Officer II